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MULTI-TRACK INTEGRATED SPIRAL INDUCTOR

ABSTRACT OF THE DISCLOSURE

An integrated receiver with channel selection and image rejection substantially implemented on a single CMOS integrated circuit is described. A receiver front end provides programable attenuation and a programable gain low noise amplifier. Frequency conversion circuitry advantageously uses LC filters integrated onto the substrate in conjunction with image reject mixers to provide sufficient image frequency rejection. Filter tuning and inductor Q compensation over temperature are performed on chip. The filters utilize multi track spiral inductors with shields to increase circuit Q. The filters are tuned using local oscillators to tune a substitute filter, and frequency scaling during filter component values to those of the filter being tuned. In conjunction with filtering, frequency planning provides additional image rejection. The advantageous choice of local oscillator signal generation methods on chip is by PLL out of band local oscillation and by direct synthesis for in band local oscillator. The VCOs in the PLLs are centered using a control circuit to center the tuning capacitance range. A differential crystal oscillator is advantageously used as a frequency reference. Differential signal transmission is advantageously used throughout the receiver. ESD protection is provided by a pad ring and ESD clamping structure that maintains signal integrity. Also provided are shunts at each pin to discharge ESD build up. The shunts utilize a gate boosting structure to provide sufficient small signal RF performance, and minimal parasitic loading.